Handheld Radio with Built-in GPS

By Gordon West

The long overdue handheld two-way radios with built-in GPS and maps are here ...

It was long overdue — a handheld two-way radio with built-in Global Positioning System and maps. Ham radio manufacturer Kenwood Corporation has proved that the utility of portable GPS automatic sending-of-position is a valuable tool over the airwaves. Thousands of hams have the Kenwood D7 amateur radio handheld, coupled with a little jumper cable to almost any type of GPS receiver that would output the NMEA datastream. Amateur radio operators will then tie in this signaling technology to the Automatic Packet Reporting System (APRS), allowing other operators around the world to see the position of the equipment as long as there is a host download station nearby that takes the packets and puts them onto a website. The system works great!

But the Kenwood D7 portable ham radio handheld with the accompanying Global Positioning System receiver was a bit bulky in light of micro-GPS capabilities. After all, GPS receivers may now be constructed within the innards of a wristwatch, so why not take this micro-GPS technology and build it into a simple two-way radio portable transceiver?

A couple of years ago, Garmin USA previewed a prototype cellular phone with a built-in GPS. This product never really got off the ground, and unfortunately, it was several years well ahead of its time. NOW, under FCC order for enhanced 911 service, many new portable cellular phones now incorporate GPS capabilities so emergency dispatchers may easily see the GPS position displayed on their dispatch center screen. While the E911 program with GPS positioning is still in its infancy, the capabilities of a single two-way radio with position-finding capabilities is thought to be a big breakthrough. But why won't a manufacturer give us a simple little handheld that could be used for license-free communications and also automatically transmit location information to another handheld with the same built-in GPS circuitry? Out hiking, Mom calls the kids and asks, "How far ahead are you on the trail?" Back comes the answer, and Mom looks down at the display and sees that she better pick up the pace because the kids are almost a mile ahead.

FIRST EVER CONSUMER GPS HANDHELD

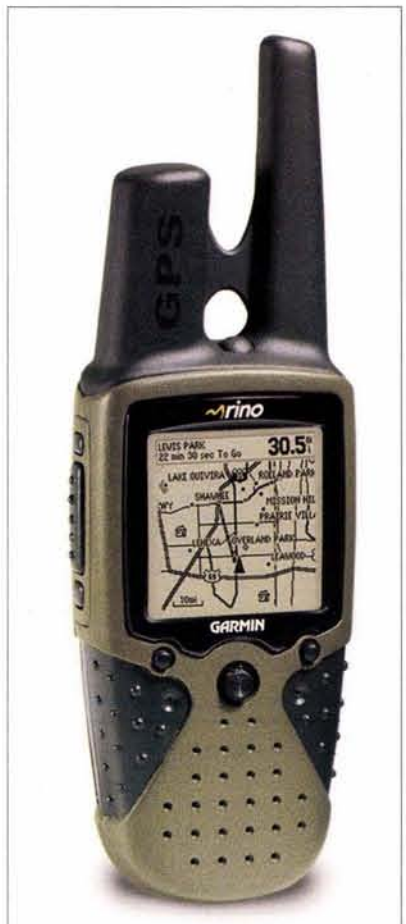
Garmin USA — a leader in marine electronics and GPS technology — announced the first-ever consumer electronics GPS positioning UHF handheld, surprisingly signaling both voice and data over the common Family Radio Service 14 channels, as well as capabilities on their step-up model for longer range General Mobile Radio Service (GMRS) repeater and simplex operation. What was truly amazing about this all-in-one transceiver was its affordable price (under $170.00 each) and capabilities to not only send voice and data on the common FRS channels, plus voice on GMRS, and also stay working even after submersion in case the canoe turns turtle.

"Federal Communications Commission rules would need to be amended to authorize Family Radio Service (FRS) units to transmit an additional emission type, and to revise the permissible communications rule that applies to FRS units," comments Dan Bartel, Director of Recreational & Consumer Electronic Sales at Garmin. In its petition, Garmin proposed to allow FRS units to transmit GPS location information using emission type F2D in a digital data burst of not more than one second.

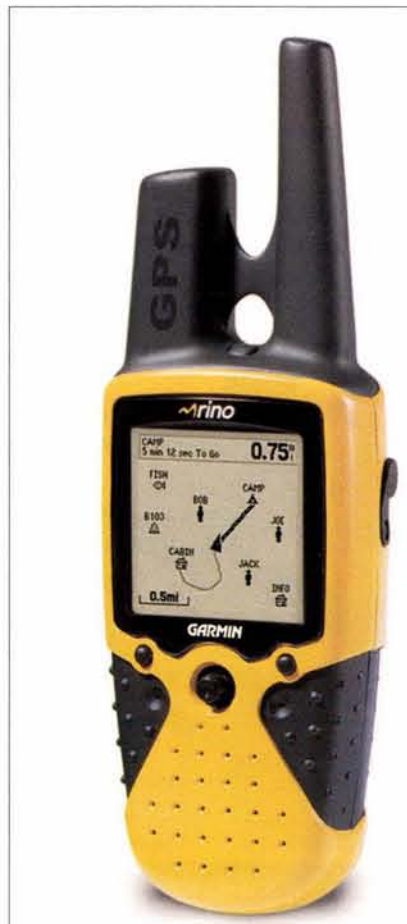
After they sent in their proposal to the FCC, there were several months for users and other radio companies to either agree with their petition or to try to block their path for a rule waiver. From what I understand, there was very little opposition, and Garmin was ultimately given the green light by the FCC to begin marketing this new concept in communications.

"We believe the record in this proceeding warrants proposing amendment ... of our rules because we (the FCC) believe that the proposed amendments will benefit FRS users," comments the FCC in their discussion of the petition in a released statement on December 20, 2001.

"Specifying only one emission type in Section 95.631(d) may have unintentionally limited some manufacturer's capability to develop FRS units that could be even more useful to the public ... we agree with Garmin that limiting



RINO 120



RINO 110

FRS units to transmitting a digital data emission for no more than one second out of a 10-second period and requiring that a digital data transmission be initiated manually by the FRS user appear to be, in combination, a reasonable method of minimizing interference between data communications and voice communications on FRS channels," adds the FCC.

The new Garmin FRS/GPS radio is nicknamed "Rino," partly because the twin antennas look a little bit like the head of a Rhinoceros, and a not necessarily so easily understood acronym on how this new radio works. I would have called it something like "COMM NAV" or simply "Radio Locator." But nonetheless, both the Rino 110 and Rino 120 support 22 communication channels, where you may select CTCSS, as well as add voice scrambling for your operation on FRS and GMRS frequencies. Keep in mind that GMRS operation requires a license. FRS does not. The Garmin radios feature 12-channel GPS with Wide Area Augmentation System (WAAS) differential correcting reception. Instead of getting down to the radius of a 30-foot circle, most Garmin WAAS-enabled receivers get you down to about a six-foot circle!

The less expensive Rino 110 has a graphic plotter screen for mapping of user waypoints and points of interest. The more expensive Rino 120 includes 8 MB of internal memory and the addition of a built-in base map of North and South America. Map detail includes cities, highways, thoroughfares, and secondary roads within metro areas. With the 8 MB downloaded, you can get all the way down to topographic, bathymetric, and street level detail via Map Source™ data from Garmin who does their own sea and land cartography in house. The Rino 120, priced at around $250.00 each, adds more mapping capabilities including running Garmin exceptionally clear and clean marine charts. This means the step-up model may be used for both boating, as well

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as on the roads.

HOW DOES IT WORK?

So, the way it works is you are communicating with another similar Rino unit from Garmin, and the other stations asks you where you are located. You look around and all you see are trees and hills. Manually activate the GPS data send function, and presto, the other station will now see how far away you are, magnetic bearing to you, and could even pull up your position on their own local map. And if you want to know where THEY are, ask them to send you THEIR position — and within just a couple of seconds, your little Family Radio Service does the number crunching and you see their distance and magnetic bearing on YOUR screen. And according to Pete Brumbaugh — the Garmin media man and in-the-know about all of Garmin products — the final version of the Rino 110 and 120 will probably get into the hands of frequent radio users with capabilities to play with configurable maps from Garmin to make the equipment exactly the way that everyone wants it to be on the airwaves, and for location position gathering. Pete says that the waiting time for a sample unit is over a few months, and they are having way too much fun themselves playing with all the bells and whistles that this equipment may offer.

Certainly, safety is a big issue in what this new GPS-based transceiver could do in an emergency. If the kids, out on the trail, trip over a rock and slide down a hill, you would ask them to send their location, and presto, you would be able to get to their location down to the radius of that six-foot circle. "Rino stands for Radios Integrated with Navigation for the Outdoors," comments Brumbaugh. "Step-up model 120 may offer a plethora of accessories including a VOX headset, vibration alert, voice scrambler, call ring function, and all of the capabilities to upload Garmin cartography," adds Brumbaugh, proudly showing off the new Rino and its unique capability to send and receive other Rino positions.

But keep in mind that the way GPS works is through the process of tri-

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These transceivers were designed for operations in an AMPS (Advanced Mobile Phone Service) cell site. The 20 MHz bandwidth of the transceiver allows it to operate on all 666 channels allocated. The transmit channels are 870.030-889.980 MHz with the receive channels 45MHz below those frequencies. A digital synthesizer is utilized to generate the selected frequency. Each unit contains two independent receivers to demodulate voice and data with a Receive Signal Strength Indicator (RSSI) circuit to select the one with the best signal strength. The transmitter provides a 1.5 watt modulated signal to drive an external power amplifier. Channel selection is accomplished with a 10-bit binary input via a connector on the back panel. Other interface requirements for operation are 26 VDC (unregulated) and an 18.990 MHz reference frequency for the digital synthesizer. The units contain independent boards for receivers, exciter, synthesizer, tunable front end and interface assembly (which includes power supplies and voltage-controlled oscillator) Schematics and circuit descriptions included.

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lateration to more than four satellites within view. Inside a shopping mall, there will be no satellites in view. So don't expect that the GPS function will work anywhere other than with a clear shot at the sky. Sure, in another 10 years, I expect to see GPS signal extenders inside shopping malls, as well as inside big factories to control robotics, but for now, the other station needs to be in view of the satellites in order to derive their GPS position fix.

WHAT'S NEXT?

Garmin also indicates that it may soon put together a program with Timex — the watch people — and this will add one more wristwatch GPS system out there tuning into the 1575 MHz satellite airwaves. The new Garmin FRS/GMRS handhelds have plenty to offer, including safety. The technology is certainly here to incorporate the Garmin GPS receiver inside any one of their many models of two-way radios. Garmin went to great efforts to convince the FCC to look over their petition on a better use for those 14 FRS channels in addition to voice, and for the next couple of years, Garmin will prove that this technology is indeed practical, affordable, and my guess, lifesaving. Look for the new Garmin radio/GPS handheld transceivers to hit the market around summertime, and let's see where they go with this new communication and radio GPS location technology. Pete Brumbaugh at Garmin welcomes your comments and questions — email pete.brumbaugh@garmin.com or phone 913-397-8200. I'm on the review list, and I'll let you know the outcome soon! **NV**